Baltic Marine Environment Protection Commission

HELCOM expert network on economic and social analyses (EN ESA) meeting

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Background

The HELCOM BLUES project[1], co-financed by the European Union, runs in 2021–2023. The project covers topics related to biodiversity, litter, underwater noise and effective regional measures and aims at supporting HOLAS III and the implementation of the BSAP and the MSFD for those Contracting Parties that are member states of the EU.

BLUES Activity 1 focuses on analyses to support effective regional measures and policies. It further develops the approaches and data for socio-economic analyses previously conducted as part of HELCOM TAPAS, SPICE and ACTION projects that supported HOLAS II and the BSAP update.

One of the tasks in Activity 1 of BLUES is to improve and conduct a regional analysis of the cost of degradation for use in HOLAS III and the next round of initial assessments by those Contracting Parties that are EU Member States. The work will assess the impacts on human well-being from not achieving a good status of the marine environment, employing a combined thematic and ecosystem services approach based on the methods developed in the TAPAS and SPICE projects for HOLAS II. The methodology is anticipated to be similar to that used in HOLAS II, with the potential addition of an approach for adjusting the cost of degradation estimates to more accurately reflect the extent of the change in the environment from current status/baseline to GES. Except for this addition, the methodology description is based on the thematic report on economic and social analyses for HOLAS II (HELCOM 2018). The cost of degradation analysis in BLUES will be conducted in 2022-2023.

This document gives basic information on cost of degradation analysis and describes the approach and progress of the work in BLUES.

Action requested

The Meeting is invited to:

- provide comments to the proposed approach for the cost of degradation analysis, particularly regarding the section “additional methodology”;
- if possible, support the proposed approach for the cost of degradation analysis.

[1] The “HELCOM Biodiversity, Litter, Underwater noise and Effective regional measures for the Baltic Sea” (HELCOM BLUES) project is led by HELCOM and co-funded by the European Union. More information at https://blues.helcom.fi

Cost of degradation analysis

Degradation of the marine environment reduces the ecosystem's ability to produce goods and services, which in turn affects human well-being. As the aim of marine policies is to achieve a good environmental status (GES), meaning that seas are clean, healthy and productive, cost of degradation can be assessed based on the benefits forgone or damages resulting from not achieving GES of the marine environment. Thus, cost of degradation measures the change in people's well-being for moving from the current or baseline status of the marine environment to the good environmental status.

Noticeable effects of degradation are decreased possibilities for marine and coastal recreation, reduction in the quality and quantity of food and other products available from the sea, adverse effects on human health, and reduced biodiversity, ecosystem health and marine resources for the enjoyment of current and future generations.

Methodology

Established methodology

The methodology for regional cost of degradation analysis was originally developed by TAPAS and SPICE projects and implemented for HOLAS II. The text below has been extracted from the HOLAS II supplementary report on Economic and social analyses in the Baltic Sea region and lightly edited for clarity.

General approach

General

- Use mainly the thematic approach, combined with the ecosystem service approach
- Examine the cost of degradation separately for each descriptor of good environmental status (grouping overlapping descriptors when appropriate) and ecosystem service
- Use the baseline and target scenarios specified in the existing valuation studies. Discuss how well these scenarios correspond to achieving good environmental status (as in HELCOM BSAP/EU MSFD) to evaluate the reliability of the estimates (note that the approach may change for this part to adjust the estimates based on the scope of change, as explained in detail in section "Additional methodology")
- Assess the cost of degradation in monetary terms if possible (if economic valuation studies are available), and if not, quantitatively or qualitatively

Data and studies

- Include both stated and revealed preference valuation studies
- Use international valuation studies to ensure comparability across countries
- Use studies covering all coastal countries when possible
- Use value transfer across countries to obtain regional estimates when there are no studies covering the entire Baltic Sea area

Evaluation

- Assess how well the studies are suited for the assessment (e.g. scenarios and environmental change, geographical coverage, time frame)

Ecosystem services

- Present additional information on ecosystem services when available (illustrations, graphs, maps, qualitative assessments)

The assessment of cost of degradation will be based on economic valuation studies that value the benefits of improving the state of the Baltic Sea. If the state does not improve, these benefits are lost, and thus they can be interpreted as the cost of degradation. The valuation studies estimate people's willingness to pay for a specific environmental change, either using surveys (stated preference studies) or by observing people's behavior (revealed preference studies).

In an ideal case, the regional assessment of the cost of degradation would rely on international valuation studies that covered all nine coastal countries, valued the environmental change in the entire Baltic Sea and presented national level benefit estimates. This would allow for both national and regional estimates of the cost of degradation.

When no regional assessments are available, assessing the cost of degradation for a particular descriptor or ecosystem service for the entire Baltic Sea region requires value transfer. Value transfer means using existing value estimates to infer values in other, previously unstudied sites. In the case of the Baltic Sea, this implies transferring the cost of degradation estimates across countries. An example of the value transfer approach is presented for biodiversity and food webs (see Table 1).

Value transfer approach

The value transfer approach entails transferring mean willingness to pay (WTP) from one or several countries of the Baltic Sea to the other countries (where estimates are not available), adjusting for differences in price levels, currencies, and income. The country where the cost of degradation estimate originates from is called the study country, and the country where the estimate is transferred to is called the policy country.

When transferring, original cost of degradation estimates (from the study country) need to be adjusted to express the value estimates in the same year, currency and price level, and to account for the effect of income level on the cost of degradation estimates (see information box below on value transfer). The value estimates are first adjusted to year 2015 using country-specific consumer price indices (CPIs). Then they are converted to common currency (euro) using purchasing power parity (PPP) adjusted exchange rates, which allow cross-country comparisons by eliminating price level differences. The estimates are also adjusted for income differences across countries, assuming that the willingness to pay is a constant share of income (income elasticity of WTP is one). This is done by multiplying the primary estimate with the ratio between the gross domestic product (GDP) per capita in each country and the GDP per capita in the study country. These are all standard adjustments in international value transfers.

When value estimates are available from several countries, i.e. there are several possible study countries, the study country needs to be chosen. The choice of the appropriate study country should be based on the similarity between the study and the policy country, as this correspondence is crucial for the reliability of the value transfer. A practical approach is to base the choice on the average income level of the countries, and transfer value estimates between countries with similar income levels.

All value transfers rely on strong assumptions. Here it is assumed that the cost of degradation estimated in one (or few) countries can be used to assess the cost of degradation in other countries with small adjustments in price levels and income. This is not necessarily the case, as additional factors, such as differences in cultural issues, attitudes and use of the Baltic Sea may cause further divergence between the estimates across countries. These factors have been observed to have a significant effect on WTP in empirical valuation studies. Adjustments for these differences are not yet standard practice in value transfers, and information on which to base the adjustment factors is not readily available, and thus they are not performed.

Cost of degradation estimates (i.e. estimates of mean willingness to pay) are transferred from one or several countries of the Baltic Sea (study countries) to the other countries (policy countries), adjusting for inflation and differences in price levels, currencies and income (see Figure 1). Adjustments are needed to express the

value estimates in the same year, currency and price level, and to account for the effect of income level on the cost of degradation estimates. Additional adjustments may be necessary to change household values to individual ones, and to express one-time estimates in annual values.

Table 1. Details of the studies that are used to assess cost of degradation.

Regional estimates are available							
Descriptor/ ecosystem service	**Focus of valuation**	**Study year**	**Area**	**Countries**	**Original value estimates**	**Source**	**In the 'State of the Baltic Sea' report (HELCOM 2017a)**
Eutrophication	Reducing the effects of eutrophication	2011	Entire Baltic Sea	All 9 coastal countries	WTP, €/person Denmark: 32 Estonia: 24 Finland: 42 Germany: 25 Latvia: 6 Lithuania: 9 Poland: 12 Russia: 9 Sweden: 76	Ahtiainen *et al.* (2014)	Yes, Ch4.1
Recreation	Improving (perceived) environmental quality by one unit	2010	Entire Baltic Sea	All 9 coastal countries	Total value, million € Denmark: 54 Estonia: 12 Finland: 84 Germany: 411 Latvia: 9 Lithuania: 18 Poland: 167 Russia: 171 Sweden: 336	Czajkowski *et al.* (2015)	Yes, Ch3, Box 3.3
No regional estimates: value transfer							
Descriptor	**Focus of valuation**	**Study year**	**Area**	**Countries**	**Original value estimates**	**Source**	**In the 'State of the Baltic Sea' report (HELCOM 2017a)**
Biodiversity and foodwebs	Increasing the amount of healthy perennial vegetation and size of fish stocks	2011	Finnish-Swedish archipelago, Lithuanian coast	Finland, Lithuania, Sweden	WTP, €/household Healthy vegetation Finland: 105 Lithuania: 44 Sweden: 209	Kosenius & Ollikainen (2015)	Yes, Ch5.6, Box 5.6.1

					Fish stocks Finland: 81 Lithuania: 35 Sweden: 169		

Value transfer approach

Cost of degradation estimates (i.e. estimates of mean willingness to pay) are transferred from one or several countries of the Baltic Sea (*study countries*) to the other countries (*policy countries*), adjusting for inflation and differences in price levels, currencies and income. Adjustments are needed to express the value estimates in the same year, currency and price level, and to account for the effect of income level on the cost of degradation estimates. Additional adjustments may be necessary to change household values to individual ones, and to express one-time estimates in annual values.

$$CoD_{policy\ country} = CoD_{study\ country} * CPI\ factor * PPP\ factor * GDP\ factor$$

$$Consumer\ price\ index\ adjustment\ (CPI)\ factor = \frac{CPI_{2015}}{CPI_{study\ year}}$$

$$Purchasing\ power\ parity\ adjustment\ (PPP)\ factor = \frac{1}{PPP_{study\ country}}$$

$$Gross\ domestic\ product\ adjustment\ (GDP)\ factor = \frac{GDP\ per\ capita_{policy\ country}}{GDP\ per\ capita_{study\ country}}$$

Data sources:

CPI data: OECD (2016). Consumer prices – all items. Accessed 29.6.2016.

PPP data: Eurostat (2016). Purchasing power parities (PPPs), price level indices and real expenditures for ESA 2010 aggregates [prc_ppp_ind]. Updated 16.6.2016, accessed 21.6.2016. Except Russia: OECD (2016). Purchasing Power Parities for GDP and related indicators. Accessed 21.6.2016.

GDP data: Eurostat (2016). Main GDP aggregates per capita [nama_10_pc]. Updated 16.6.2016, accessed 21.6.2016. Except Russia: OECD (2016). Gross domestic product (GDP). Accessed 21.6.2016.

Figure 1. Adjustments needed when transferring estimates from one country to another in the value transfer approach

Additional methodology

An important factor for the magnitude of the cost of degradation (and any) value estimate is the scope of the change in the state of the environment or ecosystem service. Scope refers to the extent of the change in terms of:

1) Quantity of change, such as increase in water clarity or reduction in the amount of beach litter
2) Geographic area of change, e.g. in hectares
3) Population affected.

If any of these three factors differ between the focus of the analysis and the original valuation study where the estimate is obtained, the estimates from the study should be scaled either up or down to reflect appropriately the scope of the change in focus. This may happen, for example, when the definitions of the baseline (current status) and policy status (GES) differ between HOLAS III and the valuation study, creating a difference in the extent of change. In this case, the cost of degradation estimate does not match the policy questions and should be adjusted for scope. For example, if the extent of change in environmental conditions in the valuation study is larger than the difference between the baseline and GES in HOLAS III, the direct use of the value estimate from the study overestimates the benefits from achieving GES.

In HOLAS II, no scaling was done to correct the estimates from the valuation studies, but the original estimates were assumed to reflect reasonably well the cost of degradation from not achieving GES. This assumption is unrealistic and produces uncertainty in the estimates (Johnston et al. 2015).

Simple approaches to correct for the scope differences do not exist, and such approaches likewise have to rely on assumptions. However, there are some general principles for scaling value estimates related to marginal/unit values. First, marginal values are diminishing in quantity, meaning that values per unit of change decrease as the size of the change increases. Second, unit area values are diminishing in area, meaning that values per unit area decrease as area increases. Both of these imply that if values are scaled up for a larger extent of change/area and constant unit values are assumed, it will lead to overestimation. Vice versa, if values are scaled down, it will lead to underestimation.

In BLUES, the most relevant adjustment for scope differences concerns the extent of change in environmental conditions. This requires information on the extent of change in the policy scenario (baseline - GES), comparison of that to the extent of change in the valuation study, and adjustment for scope differences. The simplest approach is to use constant unit values, but as explained above, that is not necessarily appropriate. Thus, BLUES will look into previous studies in the Baltic Sea region and scope effect to examine whether such information could be used to formulate an assumption on decreasing marginal values when scaling the value estimates. Furthermore, the geographic extent of the change could also be relevant for scaling the estimates, and similar approach could be used as for environmental conditions. The detailed approach for adjusting for scope is still to be decided. Regarding the population, based on previous valuation studies in the Baltic Sea are, it is reasonable to assume that the benefitting populations are the entire national (adult) populations of the coastal countries.

Work plan

The majority of the work, including preforming the analysis itself, is planned for the second half of 2022 to be conducted by the HELCOM BLUES project. However, the cost of degradation analysis relies on and benefits from other workflows within BLUES. The literature review on studies on the benefits of changes in the environment and ecosystem services and screening of relevant studies for the analyses in BLUES is currently ongoing. The compiled database will be used to identify relevant studies for the cost of degradation analysis. This is described in detail in document 4J-63 from State & Conservation 14-2021.

All required data are being gathered either within the BLUES project or in cooperation with EN ESA. No additional support needs are anticipated.

EN ESA has been and will continue to be consulted for all ESA work conducted by BLUES. Additionally, BLUES is aware of ongoing work by the HELCOM MetDev and HELCOM Data Flow projects and is maintaining contact with these projects to identify synergies.

Table 2. Planned timetable for the BLUES work related to the cost of degradation analysis

Task	Timing
Literature review and producing benefit estimates	March 2021 - March 2022
Conduct cost of degradation analysis	July 2022 - January 2023

References

HELCOM (2018): Economic and social analyses in the Baltic Sea region – HELCOM Thematic assessment 2011–2016. Baltic Sea Environment Proceedings No. 160. Available at: http://www.helcom.fi/baltic-sea-trends/holistic-assessments/state-of-the-baltic-sea-2018/reports-and-materials/

Johnston, R. J., Rolfe, J., Rosenberger, R. S., & Brouwer, R. (eds.) (2015). Benefit transfer of environmental and resource values. A Guide for Researchers and Practitioners. The economics of non-market goods and resources 14. Springer Netherlands.